

## COMMAND AND CONTROL OF NETWORK OPERATIONS

BY

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USAWC STRATEGY RESEARCH PROJECT

**COMMAND AND CONTROL OF NETWORK OPERATIONS**

by

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## **ABSTRACT**

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Command and control of network operations is required to synchronize cyberspace operations, fully utilize the concepts of Joint Net-Centric Operations (JNO), and operate and defend the joint communications network. The current network operations command and control structure does not provide the Geographical Combatant Commander unity of command or unity of effort in his execution of these requirements. The 2008 *Unified Command Plan* (UCP) assigns the Geographical Combatant Commander authority over all military operations, to include the joint theater network, in his area of responsibility. It assigns the mission of directing operation and defense of the global information grid (GIG) to Commander, United States Strategic Command (USSTRATCOM). The current network operations command and control structure was developed in support of the USSTRATCOM mission without appropriately addressing the Geographical Combatant Commander's authority over his theater network. Command relationships based on UCP assigned responsibilities and in accordance with joint command and control doctrine must be developed to provide the Geographical Combatant Commander unity of command and unity of effort to allow him to fully integrate the network as a component of the Joint Warfight.





## COMMAND AND CONTROL OF NETWORK OPERATIONS

The Department of Defense (DOD) transformation strategy is centered on Joint Net-Centric Operations (JNO). JNO is based on a concept of networking the warfighting enterprise of decision makers, nodes, platforms, sensors, and shooters. It translates information superiority into combat power by linking knowledgeable entities in the battlespace to achieve situational awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization. Information superiority is the key to achieving these effects. Information superiority supports the Joint Vision 2020 operational concepts of dominant maneuver, precision engagement, focused logistics, full dimensional protection, information operations, and joint command and control to achieve full spectrum dominance. Full spectrum dominance crosses the warfighting domains of land, sea, air, space and, designated in the 2004 *National Military Strategy* (NMS), cyberspace.<sup>1</sup>

The 2005 *National Defense Strategy* (NDS) recognizes the strategic importance and dependency our nation has on cyberspace.<sup>2</sup> It identifies vulnerabilities our adversaries could exploit and opportunities available to us based on our mutual dependence on the global information infrastructure. It led to the development of *The National Military Strategy for Cyberspace Operations* (NMS-CO), which states the end-state objective of cyberspace operations is to ensure United States freedom of action in cyberspace and to deny the enemy the same.<sup>3</sup> The NMS-CO led to a DOD definition of cyberspace that focuses the efforts of the military departments, combatant commands, and agencies. Cyberspace is defined as global domain within the information environment consisting of the interdependent network of information technology

infrastructures, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers.<sup>4</sup> From this definition, DOD identifies the global information grid (GIG) as its portion of cyberspace.<sup>5</sup> Each Service and combatant command has its own portion of cyberspace: the Army's LandWarNet, the Air Force Constellation Net, the Navy's ForceNet, and the Combatant Commander's joint theater networks.

The NMS-CO identified network operations (NetOps) as one of the fundamental ways to achieve the strategic objective of cyberspace operations. NetOps is the command and control structure for the forces, people, procedures, and equipment operating and defending the information networks and infrastructure that comprise cyberspace. The Geographical Combatant Commander's (GCC) NetOps provide the command and control and situational awareness in order to operate and defend his portion of cyberspace, the Joint Theater Network. It enables the effective and efficient execution of all warfighting functions, and facilitates the achievement of information superiority which supports an efficient decision making process. NetOps provides the command and control and situational awareness to execute synchronized computer network operations (CNO) and prevent electronic fratricide. The GCC must have unity of command and unity of effort in his NetOps command and control structure to fight and win in cyberspace.

The Assistant Secretary of Defense for Network and Information Integration (ASD NII), DOD Chief Information Officer (CIO), the Honorable John Grimes understood the requirement for command and control of NetOps and included it as one of the three goals in the *Department of Defense Network Operations Strategic Vision*. Unification of

global information grid command and control is goal two of the network operations strategic vision,<sup>6</sup> identifying successful command and control of the GIG requires unity of command and unity of effort be maintained through improved information sharing, collaboration, and conformance to the commander's intent.<sup>7</sup> The Joint Staff Director, Command, Control, Communications, and Computers (DJ6) identified a requirement in the *J6 Strategic Communications Plan* to clarify the NetOps relationship between the Services and Combatant Commands during various levels of operations.<sup>8</sup> The strategic communication plan states, "a less ambiguous command and control structure should provide for global standardization and effective interdependence throughout the global information grid while granting the GCCs the necessary authority to influence cyberspace operations within their areas of responsibility to meet theater specific objectives."<sup>9</sup>

This paper will make recommendations to organize the NetOps command and control structure to meet the requirements of unity of command and unity of effort. It will focus on the imperatives of joint command and control at the GCC and Service levels, recommending specific command relationships and responsibilities between the Geographical Combatant Command, Joint Task Force-Global Network Operations (JTF-GNO), and Services in accordance with the 2008 *Unified Command Plan* and joint command and control doctrine. It will recommend a new definition of the GIG that will delineate the separate theater information grids to support unity of command and unity of effort. It will not discuss the technical capabilities or systems required in the automated monitoring and management tools in support of the NetOps command and control structure.

## Joint Network Operations

The functions and capabilities of joint NetOps must be understood in order to gain a respect for their importance in the Warfight. The Department of Defense defines NetOps as the DOD-wide operational, organizational, and technical capabilities for operating and defending the GIG.<sup>10</sup> Joint Publication 6-0, *Joint Communications Systems*, defines NetOps as the activities conducted to operate and defend the GIG.<sup>11</sup> NetOps provide integrated network visibility and end-to-end management of networks, global applications, and information services. Network visibility allows Combatant Commanders to manage their networks as they would other combat systems.<sup>12</sup> It provides the flexibility to manage and optimize the network and adjust to the dynamic operational environment, giving them the capability to exercise command and control of forces from anywhere in their area of responsibility.

NetOps has three essential tasks required to provide the Warfighter the effect of assured network operations. The continuous operation of the GIG requires these tasks be performed at the strategic, operational, and tactical levels across all DOD warfighting, intelligence, and business areas of interest to be successful.<sup>13</sup> The tasks are: global information grid enterprise management (GEM), global information grid net assurance (GNA), and global information grid content management (GCM).<sup>14</sup> Effective integration of the NetOps essential tasks will provide the commander assured network and information system availability, assured information protection, and assured information delivery.<sup>15</sup>

Global information grid enterprise management (GEM) is defined as the technology, processes, and policy necessary to effectively operate the systems and networks that comprise the GIG. GEM merges information technology (IT) services and

NetOps critical capabilities. GEM effects are assured network and information systems availability and assured information delivery. Assured network and information systems availability provides the visibility and control over the network and information systems resources. It allows the ability to anticipate and mitigate problems through proactive measures. It ensures the uninterrupted availability and protection of the network.<sup>16</sup> Assured information delivery ensures users, systems, and decision makers have required information in a timely manner. It depends on continuous monitoring of the network to maintain the correct response time, throughput, availability, and performance of information transfer to meet users/systems needs.<sup>17</sup>

Global information grid network defense (GND) incorporates protection, detection, and response to an unauthorized activity against the GIG.<sup>18</sup> It protects data against unauthorized access and inadvertent damage or modification. GND incorporates information assurance (IA) and computer network defense (CND). IA is the measures that protect and defend friendly information and information systems by ensuring their confidentiality, integrity, availability, authentication, and nonrepudiation while denying enemy access to the same information and information systems.<sup>19</sup> CND provides defensive measures to protect and defend information, information systems, and networks from disruption, denial, degradation, or destruction. CND uses technical measures to protect, monitor, analyze, detect, and respond to malicious network activity.<sup>20</sup>

Global information grid content management (GCM) is defined as the technology, processes, and policy necessary to provide awareness of relevant accurate information; automated access to newly revealed or reoccurring information; and timely, efficient,

and assured delivery of information in a useable format.<sup>21</sup> GCM is also referred to as information dissemination management (IDM)/content staging (CS) (IDM/CS). IDM enables warfighters to perform network-enabled information management tasks and seeks to achieve the dissemination of the right information, to the right place, at the right time, and in a useable format. CS is a technique for compiling, cataloging, and caching information.<sup>22</sup>

The synchronized execution of these critical tasks allows the GCC to engineer, install, operate, and maintain the joint theater network. He has the ability to manage the electromagnetic spectrum for de-conflicting the intelligence, surveillance, and reconnaissance (ISR) assets, tactical sensors, line of sight, and ground mobile radio (GMR) systems for a fully integrated network in support of the close fight. He accomplishes these requirements through assigned and attached signal forces. His ability to move signal forces on the battlefield and shape the network to meet his intent is dependent upon an effective NetOps command and control structure that provides unity of command and unity of effort.

#### Joint Command and Control

Joint doctrine states effective command and control of joint operations begins by establishing unity of command through the designation of a Joint Force Commander (JFC) with the requisite authority to accomplish assigned tasks using an uncomplicated chain of command.<sup>23</sup> Joint doctrine is built on a sound base of warfighting theory and practical experience. It consists of twelve joint operating principals founded on the nine historic principals of war derived from the theories of Clausewitz, Sun Tzu, and Jomini and three additional principals developed through extensive mission experience.<sup>24</sup> The

key principal of war that must be achieved for effective command and control of NetOps is unity of command. Unity of command means all forces operated under a single commander with the requisite authority to direct all forces employed in pursuit of a common purpose.<sup>25</sup> Unity of command requires that two commanders may not exercise the same command authority over the same force at any one time.<sup>26</sup> The purpose of unity of command is to ensure unity of effort under one responsible commander for every objective.<sup>27</sup> Unity of effort is the coordination and cooperation toward common objectives, even if the participants are not necessarily part of the same command or organization.

Command is the most important function undertaken by a Combatant Commander. The President, through the 2008 *Unified Command Plan* (UCP), grants Combatant Commanders the authority to perform those functions of command over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training, and logistics necessary to accomplish the missions assigned the command.<sup>28</sup> The Combatant Commander can not delegate or transfer his authority.<sup>29</sup> He exercises his authority through Joint Force Commanders (JFCs) and Service and/or Functional Component Commanders (FCCs).<sup>30</sup> The GCC's authority ensures unity of command within his area of responsibility, and it must include and be applied to NetOps.

Control involves the regulation of forces and warfighting functions to accomplish the mission in accordance with the Commander's intent and priorities.<sup>31</sup> Staffs exercise control by coordinating actions and keeping the Commander informed.<sup>32</sup> GCC's grant

their J6 control of assigned and attached signal forces to install, operate, and maintain the joint network required to execute his intent.

Joint doctrine defines the command relationships the GCC will have over assigned and attached forces. The GCC will have combatant command (COCOM) of assigned forces. He will have a command relationship of operational control (OPCON), tactical control (TACON), or support (general, mutual, direct, or close support) of attached forces. Administrative control (ADCON), coordinating authority, and direct liaison are additional authorities authorized outside of formal command relationships. These relationships must be properly designated in the command and control structure to achieve unity of command and unity of effort.<sup>33</sup>

#### Current NetOps Command and Control Structure

The current network operations command and control structure is based on UCP assigned missions and authorities. The UCP assigns the responsibility of synchronizing planning for cyberspace operations, and directing GIG operation and defense to Commander, United States Strategic Command (USSTRATCOM).<sup>34</sup> Commander, USSTRATCOM assigned Joint Task Force-Global Network Operations (JTF-GNO) the mission of directing operations and defense of the GIG.<sup>35</sup> JTF-GNO published the *Joint Concept of Operations for GIG NetOps*, defining how it will execute the NetOps essential tasks for the GIG. The CONOPS provides the command and control structure supporting USSTRATCOM's UCP mission but does not appropriately address the GCC's UCP authority over its own network. It defines three separate command and control structures based on three types of network operations events: global, non-global, and theater.



Global NetOps events are activities that have the potential to impact the operational readiness of the GIG and require a coordinated response amongst Combatant Commands, Services, and Agencies.<sup>36</sup> USSTRATCOM is the supported commander in response to a global network operations event. Combatant Commands, Services, and Agencies will lead their response to global network operations events in accordance with USSTRATCOM and JTF-GNO directives.<sup>37</sup> The command and control

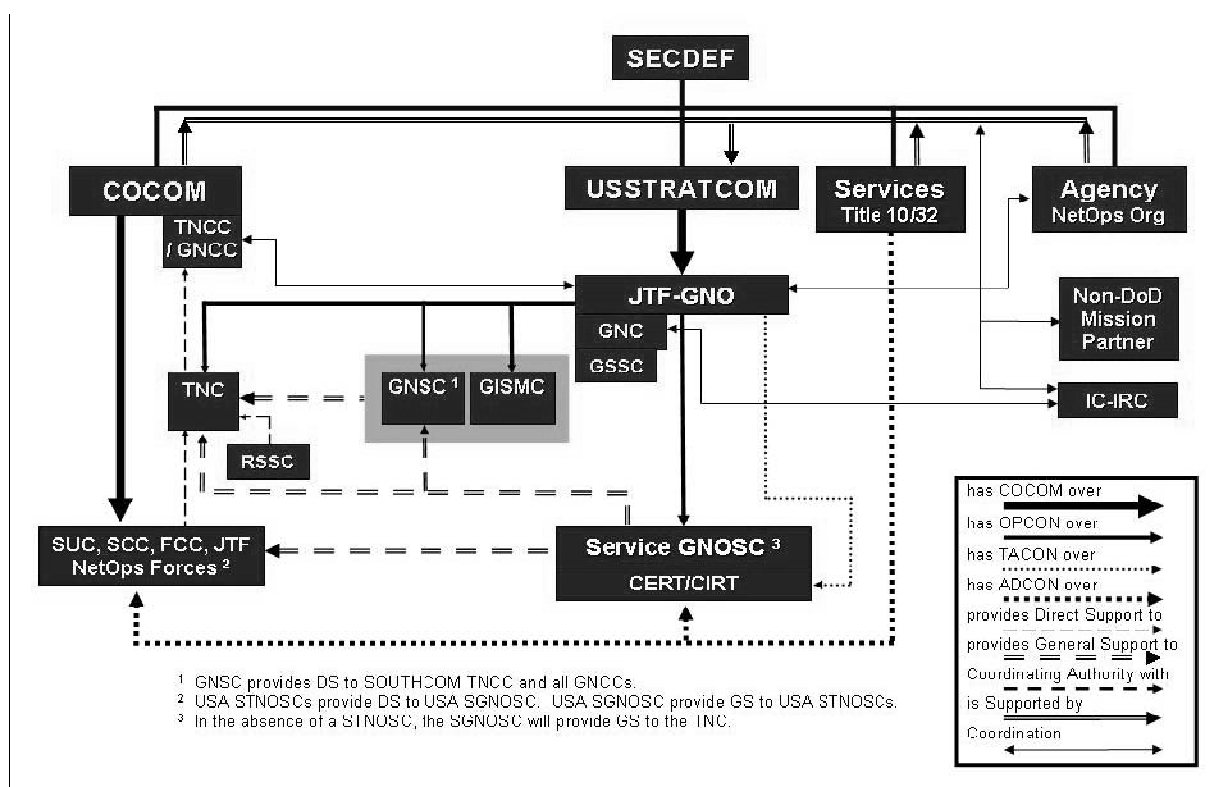


Figure 1. Global NetOps C2: USSTRATCOM is supported command<sup>38</sup>

relationships defined by JTF-GNO, figure 1, are in conflict with joint command and control doctrine. The supported/supporting relationship between combatant commands does not give the supported commander the authority to direct command relationships with the supporting commander's Service components.

Non-global NetOps events are activities whose impacts affect Functional Combatant Commands (FCC), unassigned Title 10 Service Forces, or Defense Agencies and are neither global, nor theater in nature.<sup>39</sup> USSTRATCOM will be the supported commander in response to non-global network operation events and will provide direction and general support to Functional Component Commands,

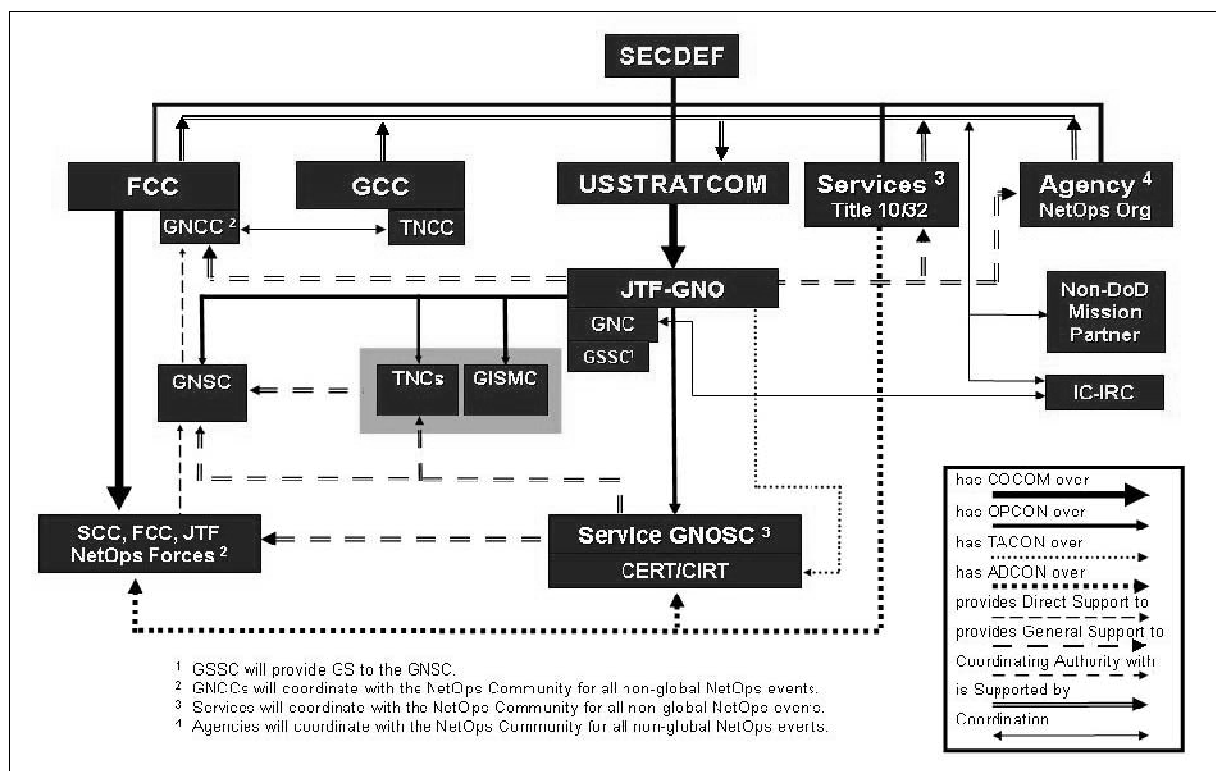


Figure 2. Non-Global NetOps C2: USSTRATCOM is supported command<sup>40</sup>

Services, and Agencies in their responses. The improperly assigned command relationships, figure 2, are continued in support of non-global network operations events. USSTRATCOM can not direct Service component relationships within another combatant command.

Theater Network operations events begin in local enclaves under the command and control of the respective GCC and have the potential to impact operations in the

theater.<sup>41</sup> The GCC is the supported commander. Combatant Commands, USSTRATCOM, JTF-GNO, Service Network Operations Components, Functional Combatant Commands, and Agencies shall provide support to theater network operations events.<sup>42</sup>

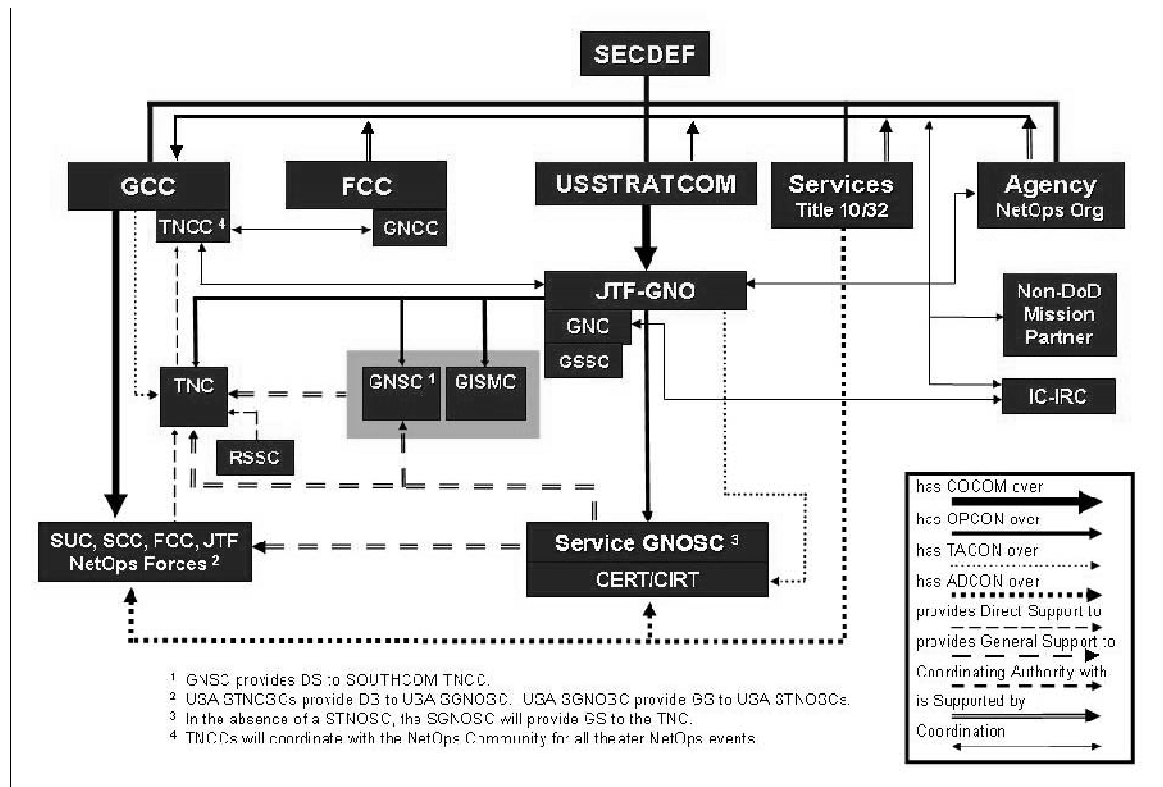


Figure 3. Theater NetOps C2: GCC is Supported Command<sup>43</sup>

Non-DOD United States Government (USG) organizations, intergovernmental organizations (State and Local), non-governmental organizations (NGO), multinational commands (alliances and coalitions), as well as commercial and research communities may also provide support per inter-governmental agreements.<sup>44</sup>

The command and control structure specified by JTF-GNO for theater network operations events, figure 3, does not support the GCC's requirement for unity of command and unity of effort. JTF-GNO's directed supported/supporting relationships

are not in accordance with joint command and control doctrine. JTF-GNO does not have the authority to assign a command relationship with Service components of another combatant command, but directs the Service Global Network Operations Security Centers (SGNOSC), under the operational control (OPCON) of USSTRATCOM, to provide general support through the Service Theater Network Operations Security Centers (STNOSC), if established. In the absence of an STNOSC, the SGNOSC will provide general support to the USSTRATCOM Theater Network Operations Center (TNC). JTF-GNO should be in direct support of the geographical combatant command's Theater Network Control Center (TNCC). All directives and coordination should be directly with the TNCC, not the STNOSCs or their own TNC, to ensure the GCC maintains unity of effort in response to these events.

JTF-GNO identified guiding principals in the command and control of network operations in their *Joint Concept of Operations for GIG NetOps*.<sup>45</sup> It recognizes joint command and control doctrine by stating "direction of operations will be conducted using supported/supporting command relationships."<sup>46</sup> It states that the supported commander has the final decision on what actions are necessary,<sup>47</sup> but contradicts itself by stating, Commander, USSTRATCOM will outline the responsibilities of the supported and supporting commanders.<sup>48</sup> The principals further state Commander, JTF-GNO will decide if a network operations event is a global event. The decision is based upon four criteria:<sup>49</sup>

- An incident crosses a Geographical Combatant Command boundary
- An incident affects multiple Combatant Commands
- An incident impacts other Department of Defense Agencies

- An incident is beyond Geographical Combatant Command Capabilities

These criteria were briefed to the Joint Chiefs of Staff Tank in an information brief on 10 August 2005.<sup>50</sup> JTF-GNO is responsible for using these criteria to make a recommendation, but does not have the authority to direct a change in Supported/Supporting relationships. Per the UCP, JTF-GNO recommends, through the Joint Staff, to the Secretary of Defense a change in supported/supporting command relationships.<sup>51</sup>

USSTRATCOM/JTF-GNO's assertion of command relationships beyond their UCP authority and not in accordance with joint doctrine disrupts the Combatant Commander's unity of command and unity of effort. JTF-GNO can not make decisions on their own accord that effect the network operations within a Combatant Commander's joint theater network. Network directives must be coordinated with the Combatant Commanders to ensure they do not interfere with current operations. Only a Secretary of Defense directed change in command relationships can override this requirement. Likewise, Services do not have the authority to direct changes in the tactical network of deployed Service forces under the operational control of the GCC. The Service network operations authority only extends through their operational base network.

#### Unity of Command and Unity of Effort Conflicts in the GIG

The GCC has authority over all military operations necessary to accomplish his assigned mission within his area of responsibility (AOR),<sup>52</sup> including his portion of cyberspace, the joint theater network. The current definition of the GIG creates a conflict in unity of command and unity of effort based on the GCC AOR authority and

USSTRATCOM's mission of directing operation and defense of the GIG. DOD defines the GIG as "all owned and leased communications and computing systems and service, software, applications, data, security services, and other associated services necessary to achieve information superiority."<sup>53</sup> The definition does not delineate a distinction between the GCC's joint theater network and the GIG. The GCC's unity of effort is degraded by USSTRATCOM's interpretation of theater networks being components of the GIG. The conflicting command and control structure has the possible consequence of degrading the network, or its services, during combat operations based upon conflicting priorities.<sup>54</sup>

The definition of the GIG also does not define operational boundaries between the Service networks and the joint theater networks for effective command and control. The relationships of the Services in the command and control structure and the conflicting authorities of their Title 10 functions, USSTRATCOM missions, and deployed forces have a major impact on unity of command and unity of effort. The current Service approach is to consolidate control of all Service network operations and tactical signal forces under the control of their SGNOSC. The Services' intent is to develop network standards, protocols, and procedures for the employment of their signal assets, prevent different requirements in each theater, and enforce Service network security standards down to deployed forces.<sup>55 56 57 58</sup> The methodology is appropriate in their Service operational base network, but does not provide the GCC full use of deployed Service capabilities. The Services develop signal packages using Service standards and interpret their USSTRATCOM mission and Title 10 responsibilities as the authority to

enforce their Service network standards within the GCC's joint theater network. The effect is a theater network that is not truly joint, but separate Service networks.

Operation IRAQI FREEDOM provides three examples of Service network standards and misinterpretation of Service authority impacting joint requirements. The Army and Air Force each installed separate Service networks at Talilli Air Base, Balad Air Base, and Ali Al Salem Air Base. In each of these locations both the Air Force and Army had separate missions on the joint base. Although United States Central Command (USCENTCOM) assigned Service responsibility for each site, the Services disagreed on the network standards and allocation of bandwidth in support of the joint force missions. The conflict between the Services and USCENTCOM degraded unity of command and unity of effort, committed forces unnecessarily, and produced unnecessary costs in materials, funding, and time.

The Services were operating on two false assumptions in each of these cases. First, Services assumed their USSTRATCOM mission of operating and defending their portion of the GIG provided authority over Service deployed tactical forces. Deployed Service forces are under the operational control (OPCON) of the GCC. Neither USSTRATCOM, nor its Service components, have authority to provide operational directives directly to deployed forces of another Combatant Commander. Second, Services are interpreting the network as a component of Title 10 support.<sup>59</sup> Title 10 requires the Services to man, train, and equip the forces required to produce the supporting tactical network of the joint theater network. The GCC's combatant command (COCOM) authority, granted under Title 10, takes precedence over Service authority and the assets deployed can be used as required to accomplish the joint

mission. This authority includes using the signal forces and NetOps assets with the configuration, standards, and protocols established by the GCC in support of joint or multi-national forces.

The lack of unity of command and unity of effort caused by the current JTF-GNO command and control structure and the inability to delineate responsibilities based on the definition of the GIG degrades the GCC's ability to achieve information superiority and synchronize cyberspace operations with the effects of all joint military fires.<sup>60</sup> To correct these deficiencies the following corrections must be made: change the definition of the global information grid to delineate the boundaries between the GIG and TIGs; develop a command and control structure that supports UCP assigned authorities and missions, follows joint command and control doctrine, and requires the Services to provide a Service Theater Network Operations and Security Center (STNOSC) in the GCC's area of responsibility; and produce joint doctrine that standardizes NetOps command and control responsibilities. The following recommendations will produce a network operations command and control structure that truly supports the Warfighter.

### Recommendations

*Redefine the Global Information Grid.* The existing definition of the GIG does not delineate the GCC's theater information grid (TIG) as a separate entity directly supporting his operations. A new definition will allow the development of a command and control structure that produces unity of command and unity of effort. It will make the operational boundaries clearly identifiable for assigning responsibilities and authorities. Responsible commanders will have the capability to synchronize NetOps with operational mission priorities.



The Army's FM 6-02.71, *Network Operations*, defines its portion of the GIG, LandWarNet, based on the DISA tiered routing layers.<sup>61</sup> The tiered approach can be used to develop a layered command and controlled structure consistent with joint doctrine.

The GIG will be the Department of Defense's backbone network consisting of the DISA owned, managed, and operated network components and defined as Tier 0.<sup>62</sup> The edge of GIG will be the Gateway entry points for accessing Defense Information Systems Network (DISN) services. The GIG will include all DISA leased communications and computing systems, telecommunications, and DOD enterprise software, applications, data, security services, and National Security Systems. It will include the Service operational base networks consisting of the Strategic to Tactical Entry Points (STEPs), teleports, regional hub nodes, area processing centers, and other Service capabilities that enable reach-back with and between the various GCC's theaters.<sup>63</sup>

The GCC's theater networks will be Tier 1 consisting of the theater devices owned by the Combatant Commanders which connect directly to Tier 0, GIG, and extend DISN services into theater level enclaves.<sup>64</sup> Tier 1 will provide deployed tactical forces the in-theater access for DISN and theater specific information services.

The Tier 2 will be the tactical networks of deployed Service forces in support of command and control of operational units. It will be under the operational control (OPCON) of the GCC. The combination of the theater network, Tier 1, and deployed forces tactical network, Tier 2, will comprise the Theater Information Grid (TIG) of the GCC.

JTF-GNO will maintain responsibility for directing operations and defending the GIG, as defined above, and for providing the needed directives, protocols, and procedures to the Combatant Commanders, Services, and Agencies for connecting their extended networks into the GIG. The GCCs are responsible for engineering, installing, operating, defending, and maintaining their TIG in support of UCP assigned missions and contingency operations. The unity of command and unity of effort achieved through clear delineation of authority allows the GCC to optimize network changes and allocate theater resources required for true JNO operations as envisioned in JV 2020. It will allow the synchronization of cyber warfare effects as a full component of joint military fires within his area of responsibility.<sup>65</sup>

*Proposed Command and Control Structure.* The proposed command relationships, figure 4, are based on joint command and control doctrine and support UCP assigned responsibilities and missions. It specifically defines the command relationships between JTF-GNO, combatant commands, and Services. The relationships ensure each have unity of command and unity of effort in managing their portions of the GIG or TIGs.

Unity of command and unity of effort require certain responsibilities and functions be met by JTF-GNO, the combatant commands, and Services. The network operations procedures defined in the *Joint Concept for GIG NetOps* version 3<sup>66</sup> remain in effect except for JTF-GNO's authority to declare global events and implement changes in command relationships. Command relationship will only be directed by the Secretary of Defense in accordance with the UCP.<sup>67</sup> USSTRATCOM, through JTF-GNO, develops the protocols, standards, and procedures for connection of the GCC's Tier 1, TIG, into

the Tier 0, GIG. JTF-GNO will provide direct support to the GCCs through the Theater NetOps Center (TNC) located within the GCC's AOR.<sup>68</sup> The TNC is under operational control (OPCON) of USSTRATCOM and is under tactical control (TACON) of the GCC for theater network issues. The TNC provides direct support to the GCC's TNCC to ensure effective operation and defense of the GIG at the edge connection into the TIG. Direct support authorizes the TNC to answer directly to the supported GCC's requests for assistance.<sup>69</sup> The supported GCC has the authority to exercise general direction of the TNC and designate and prioritize tasks necessary for coordination and efficiency.<sup>70</sup> The TNC will provide the TNCC with GIG situational awareness to plan, defend, and troubleshoot its theater network. It will issue GIG technical directives and information security products only to the TNCC to ensure complete synchronization with the GCC's priorities. The TNC will ensure that JTF-GNO has situational awareness of the theater network to meet its responsibility of providing situational awareness of all DOD networks to the Joint Chiefs of Staff and Senior Leadership in support of strategic decision requirements.

In this proposed command and control structure, the GCCs have full command and control of their theater NetOps, to include the Service theater NetOps forces and tactical signal forces deployed through Secretary of Defense orders. The J6 is responsible for exercising control, through his TNCC, of theater NetOps under the authority and priorities of the GCC. The J6 will develop the protocols, standards, and procedures for the operation of the theater network. The standards will meet the requirements of USSTRATCOM to protect the GIG while maintaining the ability to

rapidly respond to operational requirements, theater specific missions, and will apply to all deployed forces.

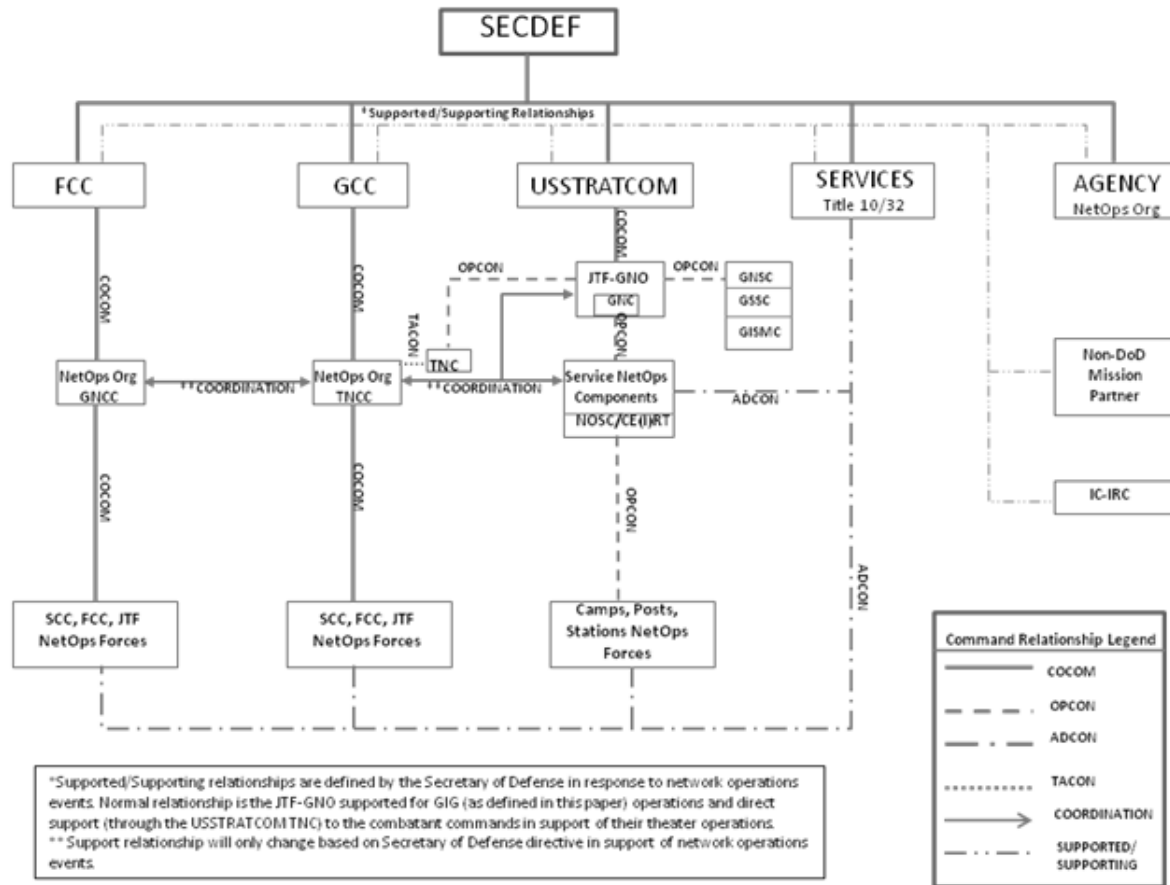


Figure 4. Proposed NetOps Command and Control (C2) Structure

The J6 must manage the entire network within the operational area and be cognizant of the performance of those portions of the global information grid outside the operational area that affect the information needs of the joint force.<sup>71</sup> The TNCC will engineer, operate, and maintain the theater network through the NetOps forces assigned and attached. The TNCC will coordinate with JTF-GNO through the TNC for apportionment of GIG assets and defense of the GIG and TIG. The TNCC will coordinate directly with the SGNOSCs for Service network requirements, and is the final approval for Service

network requirements within the joint theater network. The GCC will place the TNCC under the direction (TACON) of JTF-GNO in response to global network operations events upon direction from the Secretary of Defense.

The Service Global Network Operations Security Centers (SGNOSCs) remain under the operational control of Commander, USSTRATCOM and JTF-GNO in the proposed command and control structure. The SGNOSC will ensure the Service's portion of the GIG is secure and executing Service Title 10 enterprise responsibilities.<sup>72</sup> The SGNOSCs and the Combatant Command's theater network control centers (TNCC/GNCC) will be on an equal basis with a coordination authority relationship. Service network requirements will be coordinated directly with TNCCs to ensure incorporation into the GCC's operational priorities. The proposed relationship changes the current JTF-GNO command and control relationship in which the SGNOSC coordinated directly with the STNOSC, not the combatant command's TNCC. The general support relation between the SGNOSC and STNOSC depicted in the JTF-GNO command and control structures, Figures 1-3, is not authorized by joint doctrine unless specifically agreed upon by the Combatant Command. Direct coordination with the STNOSC creates a conflict in unity of command and unity of effort when network directives in support of GIG, or Service network, requirements are being received by the STNOSC without their GCC's knowledge or prioritization. During a theater network operations event, the SGNOSC will provide general support to the TNCC upon direction from JTF-GNO based on a Secretary of Defense directed change in supported/supporting relationships.

The Service Theater Network Operations Security Center (STNOSC) is the primary Service component in support of the GCC's joint theater network. It serves as a single point of contact for deployed Service's systems and network services; GEM, GND, and GCM capabilities; and operational reporting.<sup>73</sup> The Army provides the GCC an STNOSC as the NetOps interface between Army LandWarNet operations and the joint theater network. It is under the operational control of the TNCC. Joint Publication 6-0 and the JTF-GNO *Joint Concept of Operations for GIG NetOps* define specific tasks and responsibilities of the STNOSC in the joint theater network.<sup>74 75</sup>

JTF-GNO's CONOPS allows the Services to provide support to the Combatant Commands through their SGNOSC rather than providing an STNOSC.<sup>76</sup> The Army provides each GCC a STNOSC and an effective higher to lower NetOps structure down to battalion level.<sup>77</sup> The Air Force<sup>78</sup> and Marines<sup>79</sup> have formally published directives that the SGNOSC will be the primary NOSC for all theater operations. The Navy has the same relationship as the Air Force and Marines, but through contracted network services. Although authorized, the SGNOSC approach does not produce effective command and control relationships for the GCC. The SGNOSC are under the operational control of USSTRATCOM providing no direct authority for the GCC to direct Service network priorities within his area of responsibility. The GCC has to coordinate with the SGNOSC who must balance the priorities of all Combatant Commanders and their Service. Joint doctrine, JTF-GNO's *Joint Concept of Operations for GIG NetOps*, and Service doctrine must be changed to specifically direct each Service to allocate an STNOSC under the operational control of the GCC to ensure unity of command and unity of effort.

*Joint Network Operations Doctrine*. The implementation of the changes outlined in this paper must be documented in Joint doctrine. The Joint Staff must produce joint doctrine, as directed by Department of Defense Instruction 8410.02, and develop and coordinate joint NetOps policies, guidance, and instructions.<sup>80</sup> The current joint NetOps doctrine contained in Joint Publication 6-0 does not appropriately address the requirements of the GCC, but restates the procedures and command and control structure of JTF-GNO's CONOPS.<sup>81</sup>

The Joint Staff must produce the joint doctrine as an honest broker ensuring the authorities and requirements of the GCCs outlined in the UCP, the requirements for achieving Joint Net-Centric Operations, and the structure for synchronizing cyberspace operations are developed and published. Joint doctrine standardizes terminology, training, relationships, responsibilities, and processes among all U.S. forces and allows the Combatant Commanders and their staffs to focus efforts on solving the strategic, operational and tactical problems confronting them.<sup>82</sup> It will provide the required framework for the Services to update their doctrinal publications and JTF-GNO to update the *Joint Concept of Operations for GIG NetOps*.

## Conclusion

Successful operations in all domains of the battlespace require an effective command and control structure. Network operations not only require the same well defined command and control structure, but without it, the communications network required for command and control of all forces under the Combatant Commander is not possible. The Combatant Commander must have the authority to use all available network assets without restrictions in support of his mission. He must have the

capability to rapidly adapt the network as the operational environment changes across all six phases of operations.<sup>83</sup> The 2008 *Unified Command Plan* provides the Geographical Combatant Commander this authority within his area of responsibility. The joint community must correct the command and control conflicts between the Combatant Commands, USSTRATCOM, and Services. It must focus on achieving unity of command and unity of effort in their specific networks. Unity of command and unity of effort must be achieved to synchronize the effects of network operations and increase the effectiveness and reliability of the communications network, Joint Net-Centric Operations (JNO), and provide the foundation for Cyberspace Warfare.<sup>84</sup> A change to the definition of the GIG, a command and control structure based on UCP authorities and joint command and control doctrine, mandatory Service Theater Network Operations Security Centers in the Geographical Combatant Commanders area of responsibility, and the development of joint network operations doctrine will produce the command and control structure required by the Geographical Combatant Commander to use the network as a fully integrated component of Joint warfighting.

## Endnotes

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<sup>3</sup> Peter Pace, *The National Military Strategy for Cyberspace Operations (U)* (Washington, DC: Chairman Joint Chiefs of Staff, December 2006), 3.

<sup>4</sup> U.S. Deputy Secretary of Defense Gordon England, "The Definition of "Cyberspace,"" memorandum for Secretaries of the Military Departments, Washington, DC, May 12, 2008.

<sup>5</sup> U.S. Department of the Army, *Network Operations*, Field Manual 6-02.71 (Washington, DC: U.S. Department of The Army, November 19, 2008), 1-1.



<sup>6</sup> John G. Grimes, *Department of Defense NetOps Strategic Vision* (Washington, DC: The Pentagon, September 2008), 9.

<sup>7</sup> Ibid., 10.

<sup>8</sup> Nancy E. Brown, *Director of Command, Control, Communications and Computer (C4) Systems (J6) Strategic Communications Plan*, (Washington, DC: The Joint Staff, February 2007), 11.

<sup>9</sup> Ibid.

<sup>10</sup> Grimes, *Department of Defense NetOps Strategic Vision*, 1.

<sup>11</sup> Peter Pace, *Joint Communications Systems*, Joint Publication 6-0 (Washington, DC: The Joint Chiefs of Staff, March 20, 2006), IV-1.

<sup>12</sup> Ibid.

<sup>13</sup> Ibid.

<sup>14</sup> Grimes, *Department of Defense NetOps Strategic Vision*, 2.

<sup>15</sup> U.S. Department of the Army, *Network Operations*, 1-4 - 1-5.

<sup>16</sup> Ibid., 1-4.

<sup>17</sup> Ibid., 1-5.

<sup>18</sup> Pace, *Joint Communications System*, IV-7.

<sup>19</sup> U.S. Department of the Army, *Network Operations*, 1-7.

<sup>20</sup> Ibid.

<sup>21</sup> Pace, *Joint Communications System*, IV-7.

<sup>22</sup> U.S. Department of the Army, *Network Operations*, 1-10.

<sup>23</sup> Peter Pace, *Doctrine for the Armed Forces of the United States*, Joint Publication 1 (Washington, DC: The Joint Chiefs of Staff, May 14, 2007), IV-15.

<sup>24</sup> Peter Pace, *Joint Operations*, Joint Publication 3-0, (Washington, DC: The Joint Chiefs of Staff, February 13 2008), II-1.

<sup>25</sup> Ibid., A-2.

<sup>26</sup> Pace, *Doctrine for the Armed Forces of the United States*, IV-1.

<sup>27</sup> Pace, *Joint Operations*, A-2.

<sup>28</sup> Pace, *Doctrine for the Armed Forces of the United States*, IV-4.

<sup>29</sup> Ibid.

<sup>30</sup> Ibid.

<sup>31</sup> U.S. Department of the Army, *Operations*, Field Manual 3-0, (Washington, DC: U.S. Department of the Army, February 27 2008), 5-2.

<sup>32</sup> Ibid.

<sup>33</sup> For background and complete definitions of command relationships, see Peter Pace, *Doctrine for the Armed Forces of the United States*, Joint Publication 1 (Washington, DC: The Joint Chiefs of Staff, May 14, 2007), IV-1- IV-13.

<sup>34</sup> George W. Bush, *The Unified Command Plan* (Washington, DC: The White House, September 30, 2008), 30.

<sup>35</sup> James E. Cartwright, *Joint Concept of Operations for Global Information Grid NetOps*, version 3, (Offutt Air Force Base, NE: USSTRATCOM, August 4, 2006), 2.

<sup>36</sup> Ibid., 13.

<sup>37</sup> Ibid.

<sup>38</sup> Ibid., 14.

<sup>39</sup> Ibid., 13.

<sup>40</sup> Ibid., 15.

<sup>41</sup> Ibid., 14.

<sup>42</sup> Ibid.

<sup>43</sup> Ibid., 15.

<sup>44</sup> Ibid.

<sup>45</sup> Ibid., 11.

<sup>46</sup> For background and complete definitions of command relationships, see Peter Pace, *Doctrine for the Armed Forces of the United States*, Joint Publication 1 (Washington, DC: The Joint Chiefs of Staff, May 14, 2007), IV-12.

<sup>47</sup> Cartwright, *Joint Concept of Operations for Global Information Grid NetOps*, version 3, 11.

<sup>48</sup> Ibid.

<sup>49</sup> Ibid.

<sup>50</sup> Ibid.

<sup>51</sup> Bush, *Unified Command Plan 2008*,” 3.

<sup>52</sup> Ibid.

<sup>53</sup> Pace, *Joint Communications System*, II-1.

<sup>54</sup> For background on the missions assigned to the Combatant Commanders, see George W. Bush, *The Unified Command Plan* (Washington, DC: The White House, September 30, 2008), 1-34.

<sup>55</sup> For background on Air Force Network Operations, see Secretary of the Air Force, *Air Force Network Operations (AFNETOPS)*, Air Force Policy Directive 13-3 (Washington, DC: U.S. Department of the Air Force, January 11, 2008).

<sup>56</sup> Maryann Lawlor, “Command Takes Network Control”, *SIGNAL Online*, October 2006, [http://www.afcea.org/signal/articles/templates/SIGNAL\\_Article\\_Template.asp?articleid=1](http://www.afcea.org/signal/articles/templates/SIGNAL_Article_Template.asp?articleid=1) (accessed January 29, 2009).

<sup>57</sup> For background on Marine Network Operations, see Marine Message Headquarters, U.S. Marine Corps, “Marine Corps Network Operations (NETOPS) Command and Control (C2) Structure,” (DMS message).

<sup>58</sup> For background on Army Network Operations, see U.S. Department of the Army, *Network Operations*, Field Manual 6-02.71 (Washington, DC: U.S. Department of The Army, November 19, 2008).

<sup>59</sup> For information on Service Title 10 Functions, see Peter Pace, *Doctrine for the Armed Forces of the United States*, Joint Publication 1 (Washington, DC: The Joint Staff, May 14, 2007), III-11.

<sup>60</sup> Keith B. Alexander, “Warfighting in Cyberspace,” *Joint Force Quarterly*, Issue 46 (3<sup>rd</sup> Quarter 2007): 61.

<sup>61</sup> U.S. Department of the Army, *Network Operations*, I-10.

<sup>62</sup> Ibid.

<sup>63</sup> Chuto Onyeka, “NETCOM/9<sup>TH</sup> Signal Command (Army), briefing to Honorable John G. Grimes, OASD(NII)/DOD CIO,” briefing slides with notes, October 14, 2008, linked from Army Knowledge Online, <https://www.us.army.mil/suite/doc/13201215> (accessed February 16, 2009).

<sup>64</sup> U.S. Department of the Army, *Network Operations*, I-10.

<sup>65</sup> Alexander, “Warfighting in Cyberspace,” 61.

<sup>66</sup> Cartwright, *Joint Concept of Operations for Global Information Grid NetOps*, version 3, 16-17.

<sup>67</sup> Bush, *Unified Command Plan 2008*,” 3.

<sup>68</sup> The TNCs are a functional merger of DISA's Regional Network Operations and Security Centers (RNOSCs), Regional Computer Emergency Response Teams (RCERTs), and Regional SATCOM Support Centers (RSSC), see United States Strategic Command, "Joint Task Force-Global Network Operations, Fact Sheets," linked from USSTRATCOM home page, <http://www.stratcom.mil/default.asp?page=gactsheets&factsheet=gno> (accessed February 15, 2009).

<sup>69</sup> Pace, *Doctrine for the Armed Forces of the United States*, IV-11.

<sup>70</sup> Ibid., IV-10.

<sup>71</sup> Pace, *Joint Communications System*, IV-1.

<sup>72</sup> Cartwright, *Joint Concept of Operations for Global Information Grid NetOps*, version 3, 24.

<sup>73</sup> Ibid., 25.

<sup>74</sup> Ibid.

<sup>75</sup> Pace, *Joint Communications System*, IV-6.

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<sup>79</sup> Marine Message Headquarters, U.S. Marine Corps, "Marine Corps Network Operations (NETOPS) Command and Control (C2) Structure," (DMS message)

<sup>80</sup> Grimes, *NETOPS for the Global Information Grid*, 7.

<sup>81</sup> Pace, *Joint Communications System*, IV-2- IV-10.

<sup>82</sup> Pace, *Doctrine for the Armed Forces of the United States*, A-1.

<sup>83</sup> Pace, *Joint Operations*, V-2 – V-28.

<sup>84</sup> Alexander, "Warfighting in Cyberspace," 61.